



# Management of Beef Bulls

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## Introduction

A topic often discussed in recent times is equality of the sexes. Many cattlemen have unwittingly taken this principal and applied it to herd management, where no more emphasis is given to the selection or care of a herdsire than individual cows in the herd. Does it make sense that a single bull breeding 30 to 80 females by natural service, or perhaps several thousand females through AI, should receive emphasis equal to one female in a breeding program? The extensive, potential reproductive and productive impact of a single herdsire dictates that cattlemen practice blatant discrimination through added emphasis on bull evaluation and management, particularly with respect to reproduction.

Each year, a greater proportion of yearling beef bulls are used. With proper management yearling bulls can be a successful part of the breeding program. Bulls used as yearlings sire more calves in their productive lifetimes, and the bull cost per calf produced can be reduced. Likewise, some purebred producers prefer to market bulls as yearlings, since their investment in producing these bulls is usually reduced.

Some commercial cattlemen prefer to buy weaned bull calves and grow them out to suit themselves. If this practice is followed, it may be a good idea to select a few more bulls than will be needed, because some may not develop as anticipated.

## Goals for a Bull Development Program

1. Keep costs to a reasonable level, but do not cut corners.
2. Have the bulls well grown as yearlings, so they may be used effectively.
3. Have the bulls physically fit so they will be active breeders.
4. Minimize health problems with a well-designed herd health program developed with your local veterinarian.
5. Provide a proper environment, so genetic differences may be effectively assessed.

## Carry out a Health Program

To get all bulls off to a good start and to minimize health-related problems during the post-weaning period, a comprehensive health program should be implemented. The local animal health professional should be familiar with disease problems in the area and can recommend a disease prevention program. This may include preconditioning the calves before weaning. Vaccinations should include a booster for blackleg, malignant edema, and other clostridial diseases. Other possibilities are the viral diseases including

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the respiratory complex. Lice and other external parasites must be controlled. Internal parasites may or may not be a problem. If in doubt of the need to use a wormer, a fecal egg count may be appropriate. Read and follow label instructions of parasite control products carefully.

## Facilities

An ideal bull development facility will allow the bulls to be comfortable and protected from severe weather, will provide ample room for exercise, and enough feeder or bunk space to minimize the competition between animals. If more than 30 bulls are fed, divide them into two groups. When dividing calves into groups, horned and polled calves should be separated and sorted by size.

A well-drained facility will help minimize foot problems. Cattle that are dry and comfortable will convert feed more efficiently and gain faster. When winters are severe or exceedingly wet, some type of shelter or housing is advisable. An open-sided pole-type shed may be adequate. It should contain 25 to 30 square feet per bull.

Exercise over rough or rocky ground will help keep the bulls active and physically fit. Pens should be large enough so bulls can exercise and also get away from each other when necessary. Bulls housed away from heifers or cows tend to stay quieter and do less riding and fighting.

Many different feeding systems can be used for bulls. If a self-fed complete ration is used, so the cattle can eat free choice, 8 to 12 inches of bunk space per head is adequate. If all animals need to eat at the same time (such as with hand feeding), about 24 to 30 inches of bunk space or feeder space per bull is required.

To ensure proper feed use, water needs to be available at all times. One way to encourage exercise is to locate feed and water at opposite ends of the pen.

## Nutritional Considerations of Weaned or Purchased Bulls

### General Nutrition Concepts

An ideal nutritional program for young bulls should be moderate in cost, allow for rapid growth, and avoid excessive condition. It should also avoid digestive problems that may have an impact on animal performance or reduce soundness.

The daily nutrient requirements for medium- and large-framed bulls of different body weights and performance levels

**Table 1. Daily nutrient requirements for growing large frame beef bull calves after weaning (Gaining 2.5 lbs per day).**

<i>Weight of bull (lb)</i>	<i>Dry Matter Intake (lb)</i>	<i>Protein Intake (lb)</i>	<i>ME Mcal/ lb</i>	<i>NE<sub>m</sub> Mcal/ lb</i>	<i>NE<sub>g</sub> Mcal/ lb</i>	<i>TDN (%)</i>	<i>Ca (%)</i>	<i>P (%)</i>
600	15.5	1.82	1.09	0.69	0.42	66.5	0.51	0.26
700	17.4	1.90	1.09	0.69	0.42	66.5	0.44	0.24
800	19.2	1.97	1.09	0.69	0.42	66.5	0.40	0.23
900	21.0	2.04	1.09	0.69	0.42	66.5	0.36	0.21
1000	22.7	2.11	1.09	0.69	0.42	66.5	0.33	0.20

**Table 2. Daily nutrient requirements for maintenance and slow rate of growth (regain body condition) of young and mature bulls.**

<i>Weight of bull (lb)</i>	<i>Ave. Daily Gain</i>	<i>Dry Matter Intake (lb)</i>	<i>Protein Intake (lb)</i>	<i>ME Mcal/ lb</i>	<i>NE<sub>m</sub> Mcal/ lb</i>	<i>NE<sub>g</sub> Mcal/ lb</i>	<i>TDN (%)</i>	<i>Ca (%)</i>	<i>P (%)</i>
1300	1.0	25.4	1.9	0.92	0.53	0.28	55.8	0.22	0.19
1300	1.5	26.1	2.0	0.98	0.59	0.33	59.7	0.24	0.19
1300	2.0	26.2	2.2	1.05	0.65	0.39	64.0	0.26	0.20
1600	0.0	26.5	1.8	0.79	0.41	—	48.4	0.19	0.20
1600	1.0	29.7	2.2	0.92	0.53	0.28	55.8	0.22	0.19
2000	0.0	31.3	2.1	0.79	0.41	—	48.4	0.21	0.21

are found in Nutrient Requirements of Beef Cattle, National Research Council, Sixth Revised edition, 1984. Daily nutrient requirements for growing bulls, two-year old bulls, and mature bulls are listed in tables 1 and 2. They can serve as guidelines to determine if dietary needs are being met. Rations can be developed to meet the nutrient requirements for the desired level of performance. You may seek the assistance of a livestock nutritionist by visiting your local county extension office. Also further information about nutrient requirements and ration balancing are found in the Oklahoma Beef Cattle Manual (third edition). This publication can be ordered through any county extension office.

### **Bull Calves**

Probably the most common mistake made in purchasing young, weaning age bulls is failure to provide an adequate diet to continue their growth and development. Often bulls are delivered, turned out with the other bulls, and let to "rough it" until breeding time. Thus, bull development is delayed, sexual maturity is not achieved, and the resulting calf crop is less than it should have been.

The first step in providing adequate nutrition is determining the desired level of performance. Typically, young bulls have 160 days to grow from weaning to yearling age. Because of the growth potential of our current beef population, yearling bulls are heavier than 1000 pounds. Therefore, young bulls need to have gains of 2.5 pounds daily. Moderate energy diets (those with grain) are needed to attain these performance levels.

For young bulls not intended for gain testing, rations should include concentrates fed (as a minimum) at about 2 percent of body weight. That is, 600-pound calves can easily consume about 10-12 pounds of grain with alfalfa hay or grass hay fed free choice. This will require 18 pounds of total dry matter or about 20 pounds of air dry feed per day. This will help promote rapid growth without excessive fattening. Be certain to start the grain feeding gradually. As the bulls increase in size, the

amount of grain must increase to maintain the 2 percent of body weight level unless it is obvious that they need more high-energy feed. At this age, the bulls should be growing rapidly, so they need to have 12-13 percent total protein in their diet. Depending on the kind and quality of the roughage and the grain being fed, this will probably require that a protein supplement be included in the grain mix. Young bulls may require 16 to 20% protein in the grain mix. Mature bulls require lower concentrations of protein in the diet. However, rumen function may be impaired if the diet does not contain at least 10.5% protein. This is the reason that supplemental protein is still desirable for mature bulls grazing low quality grasses or hays.

One way to manage the feed for young bulls is to offer a high quality grass hay free choice and a concentrate fed at a rate of about 2% of body weight. An example ration for young bulls would be the following:

44% grass hay (the hay is offered free choice)  
43% cracked corn  
11% soybean meal  
0.9% limestone (calcium carbonate)  
.35% salt  
.0122% vitamin A-30000

The grain mix could be ground and mixed separately. It should be fed at the rate of 2 pounds per 100 pounds of bull body weight. To mix a one ton batch of the grain portion of the diet, the amounts of ingredients per ton would be as follows:

1566 lbs corn  
392 lbs soybean meal (44%)  
29 lbs limestone  
11.5 lbs salt  
0.5 lbs vitamin A-30000

If smaller amounts of the grain mix are to be fed to young growing bulls, the protein and calcium content must be increased

to meet the needs of these rapidly growing animals. Seek assistance from your local extension office. Remember to start the grain feeding program gradually and bring bulls up to the desired intake over at least a two-week warm-up period.

If the producer wishes to use high quality alfalfa (19% crude protein), then the concentrate portion of the ration only needs to be grain and can be provided as 1 part grain and 2 parts alfalfa hay on an as fed basis. These "dry lot" rations should produce at least 2.5 to 3 pounds a day gain for large frame bull calves.

High quality small grain pastures, such as rye and ryegrass combination pastures, are used to produce similar rates of gain. These are often the pastures used in forage-based gain tests and provide enough energy and protein to achieve average daily gains at about 2.5 pounds per day. The yearling bulls come off the test at about 1000 pounds and in a body condition score of 6. If individual producers choose this method to grow young bulls, they should not forget to supply appropriate mineral mixes to bulls on these lush pastures. Often the critical mineral needs for cattle on small grains are calcium and magnesium, minerals that wheat pasture stocker cattle need to avoid grass tetany.

### **Yearling Bulls**

Yearling bulls should be well-grown but not too fat. The energy content of a ration should be reduced if bulls are getting too fat. Fat bulls may fatigue rapidly, contributing to fewer cows conceiving.

For a yearling bull to be used successfully, he should have reached puberty 3 to 4 months before breeding time. The age of a bull at puberty depends on several interrelated factors, but size or weight and breed are probably the controlling factors.

The production of semen by a young bull largely depends on his overall growth as well as the development of his testicles and other reproductive organs. The size of testicles and volume of semen produced are positively correlated.

Bulls should also follow similar nutritional diets from the approximate 60 to 120 days from yearling age until breeding time. All bulls should be gaining weight and maintaining moderate condition during this time. Study the Body Condition Scoring System used for cows (Oklahoma Beef Cattle Manual). The system uses "1" for emaciated animals and "9" for very obese animals. Therefore, "6" is an optimum body condition score for young bulls. Perhaps the best way to verbally describe the ideal condition is bloomy but not fat. A young bull will use body stores of energy and lose over 100 pounds during the breeding season. This should come from energy stored as fat (condition) rather than muscle tissue since the bull is still growing. Excessive rapid condition loss lowers the bull's fertility and libido and should be avoided.

### **Highly Fitted Bulls**

Research at Kansas State University has illustrated that young "gain-tested" bulls have normal fertility and libido when allowed to return gradually to moderate fleshiness and hearty physical condition before the breeding season. In fact, many performance-tested bulls are returned to the owner's ranch after the gain test in order that they be allowed to be properly conditioned before the sale date. Test station sales usually offer bulls that completed their gain tests about 6 months previously.

Any rancher that purchases a young, highly fitted or conditioned bull should plan to gradually reduce the fleshiness of the bull before the breeding season. To let these bulls down, it is a good practice to start them on a ration that is not too dissimilar to the one they have been accustomed to but that is 60 to 70 percent of their previous intake. The amount of grain can be reduced at the rate of about 10 percent per week until the desired level is achieved. At the same time, substitutions should be made in the form of light, bulky feeds—such as oats or alfalfa hay. Ideally, this letdown should be completed prior to the time bulls are turned out. Dramatic nutritional changes can have an adverse effect on semen production, so it is important that these ration modifications be done gradually. Allow the change to take place gradually instead of allowing a rapid condition and weight loss which could be reflected in a reduced calf crop next year.

### **Two-Year-Old Bulls**

These cattle should have more of their mature size by breeding season, so their ration is not quite so critical. A 1300 pound 2-year-old will probably only need to gain 1 pound per day at this stage in his life. To do this, active bulls may need 35 pounds of feed or more, of which 5 to 7 pounds should be grain. Continue to monitor the total protein content of the diet and keep the concentration of crude protein near 12%. Depending on the forage available this again may require protein supplements such as soybean meal to be included in the grain mix. Monitor the body condition of the bulls closely and make grain feeding adjustments to reach the body condition score of "6" before the breeding season begins.

### **Older Bulls**

For older bulls the ideal energy level during the conditioning period will depend on their body condition at the beginning of that time. If bulls have been wintered in good condition, then 5 to 7 pounds of grain may be adequate to build the desired energy reserve. If the bulls are thin, then they may need to receive 20 pounds or more of grain per head per day. Be certain to start the grain feeding gradually. Several general precautions can help insure success of concentrate feeding. Adequate feeder space for all the bulls to eat concurrently should be available. Large bulls need about two feet per bull. High energy range cubes can be fed on the ground and can eliminate the need for bunks. Make sure all the bulls have gathered at the feeding area before feeding any grain. This will help insure that each bull gets his fair share, and this will also help avoid possible problems from overeating by a few head. Amounts of up to 10 pounds per head can be fed in a single feeding. Greater quantities should be split into two equal feedings.

When 10 pounds or less of concentrate is needed per bull, then a cereal grain (corn or milo) makes an adequate energy supplement. As the amount of concentrate fed per bull increases beyond this level, bulk up the feed with the addition of one part of oats, to two parts corn or milo. Wheat is not a good bull feed and should be avoided, since it can cause stiffness and founder.

Adequate levels of vitamin A are necessary for optimum semen production. Green-growing forages are high in vitamin A value, and cattle can store this vitamin for as long as seven months. Green color of hay is a good indicator of vitamin A value. However, because of the importance and reasonable

cost of vitamin A, to insure adequate levels, add a natural or synthetic source to supplemental feed or to the mineral supplement. This can also be accomplished by giving all bulls a vitamin A shot one or more times during the winter. Bulls should also have access to a free choice source of supplemental phosphorus year round. A mineral mix that contains 1/2 trace mineralized salt and 1/2 dicalcium phosphate can be provided. Adding 5% soybean meal to the mix will encourage greater consumptions.

Good bulls represent a substantial investment and are critical to the success of a breeding program. Proper care prior to the breeding season will help insure fertile, active bulls during that time.

## Bull Management Before the Breeding Season

To better understand nutritional need in proper bull management, the bull's year can be divided into three seasons:

1. Pre-breeding or conditioning 2 months
2. Breeding season 2-3 months
3. Post-breeding season or rest and recuperation 4-8 months

While the length of each segment may vary from one operation to another, the basic requirements during the periods 1 or 2 remain basically the same. In herds with both fall and spring breeding seasons, bulls may need a high plane of nutrition to recover body condition more quickly than if they are used just once a year.

At the start of the conditioning period, the bull battery should be fairly well established. A producer should have determined bull needs for the upcoming breeding season and then have appraised his present bull battery, in light of these needs. This evaluation should include a breeding soundness exam, which checks the reproductive capacity and physical soundness of each bull. Those bulls which prove unsatisfactory, and possibly those that are questionable, should be replaced. New bulls should be acquired at least 60 and preferably 90 days prior to the breeding season. This provides ample time for the new acquisitions to adjust to the feed and climate of an area. It also allows bulls that will be working together to become familiar with each other and to develop a social structure. Newly acquired bulls as well as the carry-overs in the bull battery should be brought up to date in a complete health program with the balance of the herd.

Proper attention and care of bulls' feet can prolong their useful life and can help insure a high rate of activity during the breeding season. After an extended period of inactivity, bull's feet may be long and misshapen. Hoof trimming should be done at the start of the conditioning period, so there is time for some regrowth which acts as a cushion during the breeding season.

## Bull Exercise

One of most critical factors for proper bull development is exercise. A bull during the breeding season might be equated to an athlete since in most situations he travels several miles each day and maintains a high degree of physical activity. Physical fitness requires several weeks of conditioning. Bulls are by nature very active and become more so as the weather warms prior to the breeding season. If given ample area in bull

pastures, bulls will usually exercise themselves. In designing bull facilities, it is a good idea to locate supplemental feeding and water areas as far apart as possible. Bulls that are physically fit when turned out will breed more cows during the breeding season because they will retain a high degree of libido and remain sound longer as well. Exercise prior to the breeding season also reduces injuries from fighting and riding normally occurring during that time.

## Bull Management During the Breeding Season

### Bull to Female Ratio

The three major goals of any breeding season should be to: get the cows settled as early in the breeding season as possible; get them bred to the bulls with the highest possible genetic worth; and achieve both as economically as possible, by getting the cows bred with the fewest possible bulls. Defining the optimum bull to female ratio is important to a successful breeding season. However, no one ratio is optimal for all ranches or small herd operations. The number of bulls required to adequately cover the breeding females is related to many factors, some of which are listed below.

### Factors Influencing Bull to Female Ratio:

#### *Distribution of the breeding females*

- Terrain
- Water availability
- Carrying capacity—feed intensity
- Pasture adaptation
- Pasture size

#### *Bull variation*

- Age
- Condition
- Mating ability
- Libido
- Fertility
- Sperm reserve
- Social behavior
- Injury

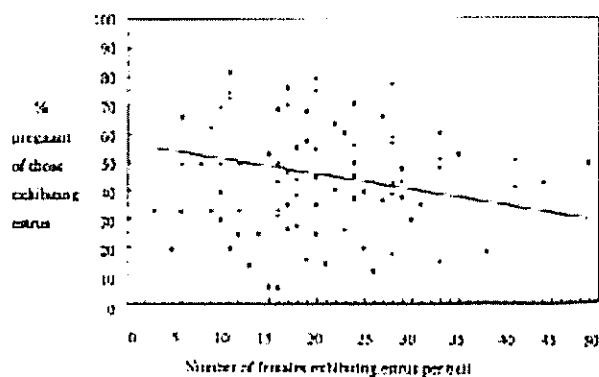
#### *Management decisions*

- Length of breeding season
- Reproductive diseases
- Breeding intensity
- Amount of observation

Most of these factors must be considered to define the optimum bull to female ratio. The following graph illustrates how difficult it is for producers to know what the optimum cow: bull ratio should be. This study, conducted in Colorado, shows the percentage of synchronized females that bulls impregnated when given the opportunity to breed 7 to 51 synchronized females. Notice that some bulls had a poor percentage pregnant even when exposed to small numbers of females and some bulls had a high percentage pregnant even though they were running with 30 or more synchronized females.

Proper management during the breeding season should result in each female being bred by a single fertile bull each time she is in estrus. Bull overlap (more than one bull breeding a cow in heat) is not desirable, primarily because it does not enhance pregnancy rates. Disadvantages of bull overlap are





**Figure 1. Effect of number of females exhibiting estrus on the percentage pregnant by each bull in single-sire mating of estrus synchronized females. (Pexton, et al. 1990)**

increased risk of bull injury (through competition for estrous females), additional pressure from social dominance and the extra costs incurred by purchasing and maintaining more bulls.

Recent research at an Eastern Colorado research station, where the average carrying capacity is 25 acres per-animal-unit-year, showed similar conception rates for bull to female ratios of 1:25 and 1:50. This research was conducted with multi-sire breeding pastures. All of the bulls were experienced bulls that had previously passed a breeding soundness examination.

Bull overlap can be decreased by eliminating bull congregation within breeding pastures. This can be achieved by dividing the breeding herd into separate pastures or by using pastures that have natural barriers that reduce mixing of breeding groups. In addition, riders can be used to keep bulls well distributed among breeding groups.

These large cow to bull ratios can reduce bull costs on very large ranches with minimal risk. On a small 50 to 100 cow operation, using just one bull that happens to undergo an injury or disease could spell disaster for an entire calf crop.

Recommendations for smaller herds that will utilize only one bull per pasture may need to be more conservative. A time honored rule-of-thumb is to place about the same number of cows or heifers with a young bull as his age is in months. For instance a bull that is 14 months old going into his first

breeding season should be expected to breed 14 or 15 cows; whereas as a two-year old bull may be placed with 20 - 25 cows. Mature bulls that have been examined by a veterinarian and have passed a breeding soundness exam can be placed with 25 - 35 cows and normally give good results.

### Social Behavior

Social ranking (dominance) of bulls can influence their sexual activity when they are run in multiple-sire breeding pastures. Probably the best example of this resulted in an Australian study. In that study, calves that were born to cows bred as a herd to the same three or four bulls over five years were blood-typed to establish their sire. The results (Table 3) showed that the oldest or second oldest bull in the group sired 60 percent or more of the calves each year, while the youngest sired 15 percent or fewer. As social ranking in bulls is largely controlled by age and seniority within groups, it is reasonable to assume these results reflect the influence of social ranking on the reproductive capabilities of the bulls.

The importance of these results becomes clear when considering either the reproductive or genetic implications. If the dominant bull were sterile, or even sub-fertile, at least a portion of these cows would probably have calved late or even missed calving entirely. On the other hand, if the younger bulls were superior genetically in traits of economic importance, the total value of the calf crop produced would have been reduced. To avoid dominance problems, bulls of the same size and age should be used together. Young bulls, especially yearlings, should not be expected to compete with older bulls in the same breeding pasture.

### Rotation

Rotation of bulls can be done to ease the breeding pressure on any one bull or groups of bulls. Some producers choose to synchronize the cows or heifers with products on the market for this purpose. In this case, use the best bulls first, so that the better bulls will have a chance to breed a large number of cows while the herd is still concentrated. This will maximize the input of these superior bulls on the entire calf crop and especially in the heifer group that will be candidates for replacements. Use poorer quality bulls for "clean-up" bulls. Rotating bulls in this regard allows rested bulls to replace those that have located and serviced a large number of synchronized females in estrous during the first 2 weeks of the breeding season.

**Table 3. Reproductive performance of three or four bulls exposed to a group of cows over a five-year period.**

Bulls Used	Percentage of Calves sired by Each Bull				
	Year 1	Year 2	Year 3	Year 4	Year 5
A	70.4 (10) <sup>a</sup>	76.0 (11)	12.2 (12)	0 <sup>b</sup>	0 <sup>b</sup>
B	16.7 (4)	18.0 (5)	63.4 (6)	72.5 (7)	25.1 (8)
C	7.4 (3)	6.0 (4)	12.2 (5)	12.5 (6)	62.5 (7)
D	5.5 (2)	0 <sup>b</sup> (3)	12.2 (4)	15.0 (5)	12.4 (6)

<sup>a</sup> Age of bull in years

<sup>b</sup> Bulls absent from the herd

Much has been written about rotating bulls during the normal non-synchronized breeding seasons. Some producers turn their older bulls out early in the breeding season, then follow up with the young bulls late in the season. In this way, the youngsters get some use, but they are not left out long enough to cause any long-term setback. If only young bulls are in the bull battery, then rotating them at a minimum of two weeks, will allow for optimum reproductive performance and not allow young bulls to become too fatigued and lose condition too rapidly. If pasture and management capabilities allow, rotating young bulls once per week should slightly improve reproductive performance, because depleted sperm stores would be replaced with rested bulls before any decrease in fertility should be occurring.

Each producer will need to develop a bull management plan that works best for his or her operation. That plan, if it is to be successful, will need to be flexible to adjust for problems as they arise.

### **Bull Observation**

A good manager keeps an eye on his bulls during the breeding season to make sure that they are getting the cows bred. Injuries to bulls during the breeding season are relatively common. When a bull does become lame or incapable of breeding, because of an injury to his reproductive tract, he needs to be removed from the breeding pasture and replaced by another bull.

Occasionally, a bull that has passed a breeding soundness exam may have difficulty serving cows in heat, especially after heavy service. Inability to complete normal service and low fertility are more detrimental than failure to detect cows in heat to calf crop percent. Such problems can best be detected by observing bulls while they work. Likewise, a small proportion of bulls can wear out from heavy service and lose interest. These, too, will need to be replaced. The greater the number of cows allotted to each bull in the breeding pasture the more critical it is that every bull be ready to work every day of the breeding season.

### **General Management**

Good managers do everything possible to facilitate a bull's job. Occasionally, cattle are moved long distances during the breeding season, such as driving cows to a rented pasture. Bulls will arrive in better shape if they are hauled in a truck or trailer instead of being expected to travel with the cow herd. Not only will they be less tired, but their feet should stay in better shape.

### **Bull Management After the Breeding Season**

After the breeding season, bulls become a necessary evil or unwelcome visitor. Many producers might like to forget about them for the balance of the year and some almost do. While it is true that bulls during the post-breeding season don't require much management, adequate planning and care can help insure that bulls' costs will be kept within reason and that bulls will be ready to go again the next time they are needed.

In most spring calving herds, the breeding season will commence in the spring or early summer and extend for two to three months. If a 60-day pre-breeding conditioning period is allowed, this leaves a post-breeding season of about seven

months, usually coming in the fall and winter. Goals for this period are basically as follows: Keep feed costs at a practical minimum; keep the bulls in moderate condition; minimize chance of injuries; and allow growth of young bulls.

### **Post-Breeding Appraisal**

As bulls come out of the breeding pasture, one of the first steps should be to appraise the bull battery and sort them three ways. The largest group should be the mature bulls in good condition that won't require any special care. Perhaps the most important group is the young bulls that are still growing and need higher quality feed during the winter. Bulls that are extremely thin or need special care for other reasons can be placed in this group as well. The last group is for old or crippled bulls that have completed their productive life and are to be marketed.

All bulls should have access at all times to a high-quality mineral mix. Phosphorus is a critical mineral for successful reproduction and is not present in adequate amounts in dry or harvested forage. Good sources of supplemental phosphorus are steamed (feed grade) bone meal or dicalcium phosphate. These can be mixed with trace mineral salt in equal parts or two parts salt to one part mineral.

Vitamin A nutrition also is important to the resting bull. Natural sources are green, growing plants or high-quality hay with good green color. Supplemental vitamin A can be added to the mineral mix or fed with a supplement. It can also be administered in the form of an intramuscular injection once or twice during the winter, although the oral supplement is cheaper.

Mature bulls in good condition can exist very well on an essentially all-roughage diet. While the amount will vary some with the size of the cattle, a good rule to remember is about 2 percent of their body weight in dry feed per day. Protein needs will parallel closely those of a dry pregnant mature cow in the middle-third of gestation, so it can be supplemented as needed.

### **Yearlings**

Yearlings should be left with the cow herd for 60 days or less. Beyond that time, their condition will fall off to such a degree that it may have long-range effects upon their growth. After removal from the cow herd, yearlings should be kept separate from the older bulls at least through their second winter.

Yearlings should be placed on the best available roughage, such as regrowth from hay fields or high quality hay. Their supplemental feeding regime can be equated to the program for bred-yearling heifers. These cattle still are growing rapidly, in addition to replacing all the condition they lost in the breeding pasture. Extra care and feed of yearling bulls after the breeding season will result in stronger, more attractive mature bulls with a much higher salvage value.

### **Salvage Bulls**

Often, bulls that have completed their productive life because of age or injury can be marketed to advantage after a brief period on a high-energy feed program. Bulls will vary greatly in condition at the end of the breeding season, depending upon the number of cows per bull, the length of the breeding season, and the quality of the feed available.

However, most bulls will gain very rapidly and efficiently after the breeding season if they are provided with the necessary nutritional level. These bulls should be placed on excellent pasture or free-choice hay of high quality and then fed a full feed of the concentrate feed that provides the most economical energy source (usually a cereal grain). Concentrates can be fed at the rate of 20 to 25 pounds per head per day, although when fed at this level the concentrate should be split into two equal feedings. Start the bulls slowly and gradually increase the grain level to avoid digestive disturbances. At this nutritional level, bulls can be expected to gain between 3 and 5 pounds a day for at least 60 days. Mature cattle also make excellent use of silage, if that feed is available.

### Bull Pastures

It is a good idea to have a bull pasture that is somewhat isolated. Bulls kept away from cows will remain quieter and will fight less. A pasture with adequate area also will encourage exercise and will reduce confrontations between bulls.

One additional consideration is to make sure that bulls have ample protection from the extreme weather stress. Spring blizzards can cause frost bite of bulls' scrotums, affecting the normal function of the testes and epididymis. Since development and maturation of sperm takes about 60 days, stress in February, March, and April can cause poor semen quality in April, May, or June.

### Bull Exposure as a Management Tool

Bull exposure (to the cows and heifers) after calving can be a management tool to aid producers in shortening the next calving season. Bull exposure is defined as co-mingling of cows or heifers with bulls shortly after calving and before the cows have returned to normal heat cycles. The presence of the intact (non-castrated) male has been known for years to hasten the onset of puberty in swine. Recent research at the University of Nebraska has indicated that cows that are exposed to vasectomized bulls from the time of calving until the start of the breeding season return to heat 11 days (1991 study) to 20 days (1983 study) sooner than counterparts that are separated from bulls until the traditional start of the breeding season. Apparently, there is no difference in the response of the cows due to the age of the bull. Cows exposed to yearling bulls were compared to cows exposed to mature bulls and to non-exposed cows in the study reported in 1991. Approximately 150 cows were used in each treatment group. Cows exposed to vasectomized yearling bulls returned to estrus in an average of 61.8 days, cows exposed to mature bulls acted similarly (59.5 days). Postpartum intervals to the return of heat were considerably longer in the cows not exposed to bulls at 72.3 days after calving. Figure 2 graphically illustrates the differences in the percentage of cows returning to heat in the first 4 1/2 months following calving. The percentage of cows returning to estrus in the group not exposed (NBE) to bulls lags behind the groups exposed to yearling (YBE) or mature (MBE) bulls.

How best to utilize this research information is the challenge of the commercial cow-calf producer. There are several important economic factors that should be involved with any decision to utilize the concept of "bull exposure." (1) Creating and maintaining surgically altered or vasectomized bulls can be expensive. (2) The early-calving cows will generally return to

estrus by the time the normal breeding season begins without the added influence of the "bull exposure." (3) The late-calving cows are those that most producers would like to "move-up" into the heart of the calving season. Therefore, a plan to best utilize this information would be to place only the late-calving cows (for instance, the last one-third) into the "normal" bull pasture until the start of the normal breeding season. This would take advantage of the positive impact of bull exposure on those cows that would most benefit from the shortened postpartum interval. No extra surgically altered bulls would be necessary to maintain. These late calving cows will not return to estrus until well into the normal breeding season, so there is no danger of extremely early calves from this group. However, they should move up one week to 10 days (on the average) for the next year's calving season. No additional feed costs have been incurred other than the small difference in labor that may result from feeding a few cows with bulls instead of feeding all of the cows together. At the start of the breeding season, all of the cows and bulls are run together in the normal fashion. If the producer routinely has an A.I. program, "gomer" (surgically altered bulls, normally used for heat detection during the breeding season) could be placed in the pasture where all the cows that have calved are held. This then should have a positive impact on the entire herd.

An example scenario where natural mating is used might include the following data on a "typical" spring calving season. The first calf is born on February 10. About 2/3 of the calves arrive by March 20 and the last calf arrives on April 25. The breeding season for next year's calf crop will begin on May 1 and conclude on July 15. Cows that calve on or after April 1 would be placed in the bull pasture with their baby calves as soon as the calf and mother are in strong enough health to leave the maternity pen.

Several words of caution must be expressed. The positive impact of bull exposure after calving is NOT an excuse for year-long breeding and calving seasons. Controlled, short breeding and calving seasons are the goals of utilizing this information. Do not turn cows with bulls more than 30 days prior to normal breeding season. Some cows will cycle early, breed too early, and therefore have a calf much ahead of the rest of the cowherd. This is especially likely to occur with fall-calving cows that are in very good body condition. Bull exposure will be most effective with healthy cows that are in a "good" body

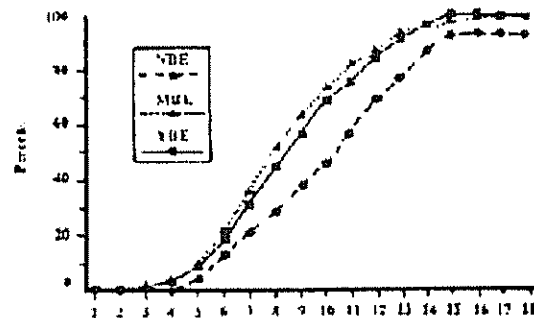


Figure 2. Percentage of cows initiating estrous cycles after calving.

condition at the time of calving and are allowed to maintain that condition into and through the breeding season. This is a tool that will have only a small impact on weaning weights and reproductive rates, but the out-of-pocket cost is little or nothing, and therefore should produce a relatively high return on investment.

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